



EMC TEST REPORT

No. I19Z61344-EMC03

for

OnePlus Technology (Shenzhen) Co., Ltd.

Smart Phone

Model Name: HD1925

FCC ID: 2ABZ2-EE143

with

Hardware Version: 46

Software Version: Oxygen OS 10.0.HD61CB

Issued Date: 2019-10-26

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of CTTL.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I19Z61344-EMC03	Rev.0	1st edition	2019-10-26

Note: the latest revision of the test report supersedes all previous version.

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1. Test Laboratory

1.1. Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2005 accredited test laboratory under NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAM (NVLAP) with lab code 600118-0, and is also an FCC accredited test laboratory (CN5017), and ISED accredited test laboratory (CN0066). The detail accreditation scope can be found on NVLAP website.

2. Test Laboratory

2.1. Testing Location

Location 2: CTTL(Shouxiang)

Address: No. 51 Shouxiang Science Building, Xueyuan Road, Haidian District, Beijing, P. R. China 100191

2.2. Testing Environment

Normal Temperature: 15-35°C

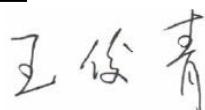
Relative Humidity: 20-75%

2.3. Project data

Testing Start Date: 2019-09-12

Testing End Date: 2019-10-25

2.4. Signature



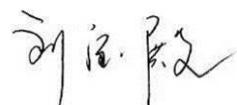
Wang Junqing

(Prepared this test report)



Zhang Ying

(Reviewed this test report)



Liu Baodian

Deputy Director of the laboratory

(Approved this test report)

3. Client Information

3.1. Applicant Information

Company Name: OnePlus Technology (Shenzhen) Co., Ltd.
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City: Shenzhen
Postal Code: /
Country: China
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3.2. Manufacturer Information

Company Name: OnePlus Technology (Shenzhen) Co., Ltd.
Address: 18C02, 18C03, 18C04 and 18C05, Shum Yip Terra Building, Binhe Avenue North, Futian District, Shenzhen
City: Shenzhen
Postal Code: /
Country: China
Contact Person: Ariel Cheng
Contact Email: ariel.cheng@oneplus.com
Telephone: 13823398081
Fax: /

4. Equipment Under Test (EUT) and Ancillary Equipment (AE)

4.1. About EUT

Description Smart Phone
Model Name HD1925
FCC ID 2ABZ2-EE143
Extreme vol. Limits 3.6VDC to 4.3VDC (nominal: 3.87VDC)

Note: Components list, please refer to documents of the manufacturer; it is also included in the original test record of CTTL-Telecommunication Technology Labs, CAICT.

4.2. Internal Identification of EUT used during the test

EUT ID*	IMEI	HW Version	SW Version
EUT21	990013820050081	46	Oxygen OS 10.0.HD61CB

*EUT ID: is used to identify the test sample in the lab internally.

4.3. Internal Identification of AE used during the test

AE ID*	Description	SN	Note
AE1	battery	/	/

AE1
Model BLP745
Manufacturer Sunwoda Electronic Co.,Ltd.
Capacitance 4010mAh

*AE ID: is used to identify the test sample in the lab internally.

4.4. EUT set-ups

EUT Set-up No.	Combination of EUT and AE	Remarks
Set.10	EUT21 + AE1	ERP/EIRP/RSE tests

5. Reference Documents

5.1. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title	Version
FCC Part 90	PRIVATE LAND MOBILE RADIO SERVICES	10-1-16 Edition
ANSI/TIA-603-E	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards	2016
KDB 971168 D01	Measurement Guidance for Certification of Licensed Digital Transmitters	v03r01
ANSI C63.26	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services	2015

6. LABORATORY ENVIRONMENT

Fully-anechoic chamber FAC-3 (9 meters × 6.5 meters × 4 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 15 %, Max. = 75 %
Shielding effectiveness	0.014MHz - 1MHz, >60dB; 1MHz - 1000MHz, >90dB.
Electrical insulation	> 2 M
Ground system resistance	< 4
Site voltage standing-wave ratio (<i>S</i> _{SWR})	Between 0 and 6 dB, from 1GHz to 18GHz
Uniformity of field strength	Between 0 and 6 dB, from 80 to 4000 MHz

7. SUMMARY OF TEST RESULTS

7.1. Summary of test results

Abbreviations used in this clause:		
Verdict Column	P	Pass
	F	Fail
	NA	Not applicable
	NM	Not measured
Location Column	1/2/3/4	The test is performed in test location 1, 2, 3 or 4 which are described in section 1.1 of this report

CDMA800 BC10

Items	Test Name	Clause in FCC rules	Section in this report	Verdict	Test Location
1	Output Power	90.635(b)	5.4	P	Shouxiang
2	Emission Limit	90.691, 2.1051	5.5	P	Shouxiang

7.2. Statements

The test cases listed in section 7.1 of this report for the EUT specified in section 3 were performed according to the standards or reference documents in section 5.1

The EUT met all applicable requirements of the standards or reference documents in section 5.1. This report only deals with the CDMA functions among the features described in section 4.

8. Test Equipments Utilized

NO.	Description	Type	Series Number	Manufacture	Cal Due Date	Calibration Interval
1	EMI Antenna	VULB9163	9163-235	Schwarzbeck	2019-11-20	1 year
2	EMI Antenna	3117	00058889	ETS-Lindgren	2020-02-02	1 year
3	EMI Antenna	3117	00119024	ETS-Lindgren	2020-02-25	1 year
4	EMI Antenna	9117	167	Schwarzbeck	2020-05-27	1 year
5	Signal Generator	N5183A	MY49060052	R&S	2020-06-24	1 year
6	Test Receiver	E4440A	MY48250642	Agilent	2020-03-18	1 year
7	Universal Radio Communication Tester	CMW500	143008	R&S	2019-11-26	1 year

Test Software Utilized

Test Item	Test Software and Version	Software Vendor
ERP/EIRP/RSE	Tile V7.2.3.5	ETS-Lindgren

ANNEX A: MEASUREMENT RESULTS

A.1 OUTPUT POWER

Reference

FCC: CFR Part 90.635, and 2.1053

A.1.1 Summary

During the process of testing, the EUT was controlled via Agilent Universal Radio Communication Tester (E5515C) to ensure max power transmission and proper modulation.

This result contains peak output power and ERP/EIRP measurements for the EUT.

In all cases, output power is within the specified limits.

A.1.2 Radiated

A.1.2.1 Description

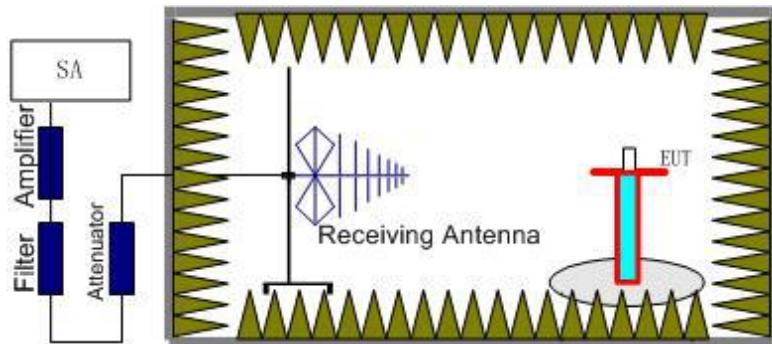
This is the test for the maximum radiated power from the EUT.

Rule Part 90.635(b) specifies "The maximum output power of the transmitter for mobile stations is 100 watts (20 dBw)."

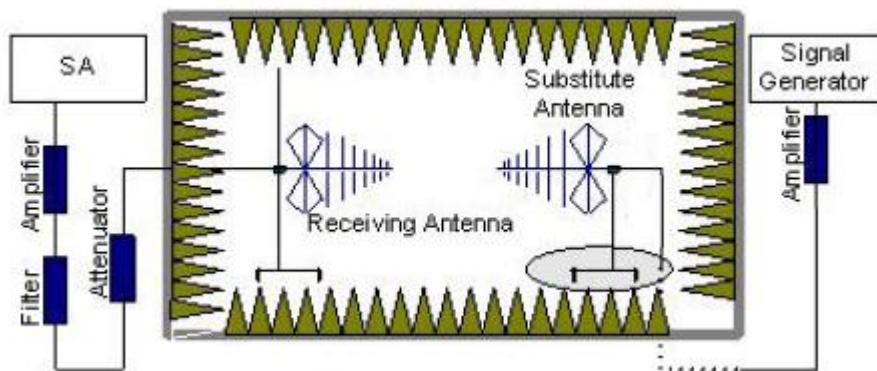
A.1.2.2 Method of Measurement

The measurements procedures in TIA-603-E-2016 are used.

1. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all transmit frequencies in three channels (High, Middle, Low) were measured with peak detector.



2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (Pr).
3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



In the chamber, a substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna. Adjust the level of the signal generator output until the value of the receiver reaches the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4. An amplifier should be connected to the Signal Source output port. And the cable should be connected between the amplifier and the substitution antenna.
 The cable loss (P_{cl}), the substitution antenna Gain (G_a) and the amplifier Gain (P_{Ag}) should be recorded after test.
 The measurement results are obtained as described below:

$$\text{Power (EIRP)} = P_{Mea} - P_{Ag} - P_{cl} - G_a$$
5. This value is EIRP since the measurement is calibrated using an antenna of known gain (Unit dBi) and known input power.
6. ERP can be calculated from EIRP by subtracting the gain of the dipole, $ERP = EIRP - 2.15$.

For test layout photo, please refer to Pic.1 in Annex B.

UAT Measurement Results:
CDMA800(BC10)- ERP
Limits

Band	Peak ERP (dBm)
CDMA800(BC10)	≤50dBm

Measurement result
1x RTT

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	P _{Ag} (dB)	G _a (dBi)	Correction (dB)	Peak ERP(dBm)	Polarization
817.9	-22.82	2.18	45.87	1.03	2.15	19.75	H
823.1	-21.00	2.24	45.80	0.10	2.15	20.51	H

Sample calculation: 823.10 MHz

$$\text{Peak ERP (dBm)} = \text{PMea}(-21.00\text{dBm}) - \text{Ga}(-0.10\text{dBi}) - \text{PAg}(-45.80\text{dB}) - \text{Pcl}(2.24\text{dB}) - 2.15 \\ = 20.51 \text{ dBm}$$

Ev-Do

Frequency (MHz)	P _{Mea} (dBm)	P _{cl} (dB)	P _{Ag} (dB)	G _a (dBi)	Correction (dB)	Peak ERP(dBm)	Polarization
817.9	-23.23	2.18	45.87	1.03	2.15	19.34	H
823.1	-21.38	2.24	45.80	0.10	2.15	20.13	H

Sample calculation: 823.1MHz

$$\text{Peak ERP (dBm)} = \text{PMea}(-21.38\text{dBm}) - \text{Ga}(-0.10\text{dBi}) - \text{PAg}(-45.80\text{dB}) - \text{Pcl}(2.24\text{dB}) - 2.15 \\ = 20.13 \text{ dBm}$$

 Note1: Expanded measurement uncertainty is $U = 2.84 \text{ dB}$, $k = 2$.

Note2: The worst case is verified for LAT.

A.2 EMISSION LIMIT

Reference

FCC: CFR Part 90.691 and 2.1053

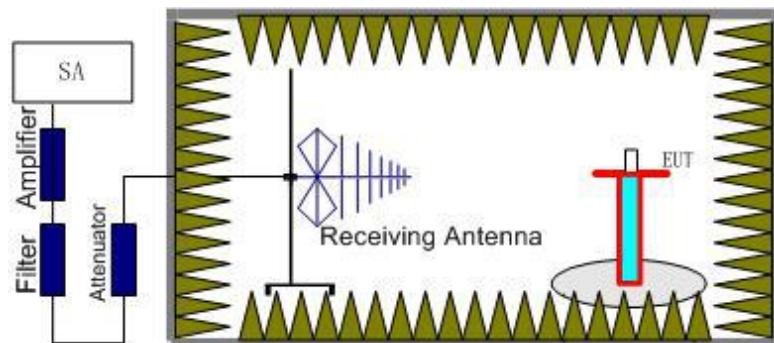
A.2.1 Measurement Method

The measurements procedures in TIA-603-E-2016 are used. This measurement is carried out in fully-anechoic chamber 3.

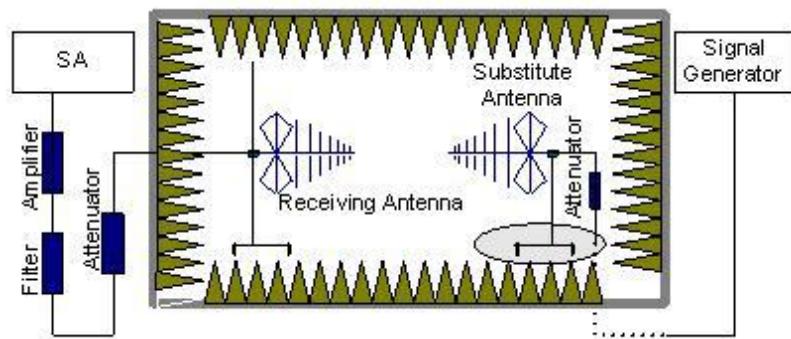
The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1910 MHz. The resolution bandwidth is set 1MHz as outlined in CFR Part 90.691. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of CDMA800 BC10.

The procedure of radiated spurious emissions is as follows:

1. EUT was placed on a 1.5 meter high non-conductive stand at a 3 meter test distance from the receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT for emission measurements. The height of receiving antenna is 1.5m. The test setup refers to figure below. Detected emissions were maximized at each frequency by rotating the EUT through 360° and adjusting the receiving antenna polarization. The radiated emission measurements of all non-harmonic and harmonics of the transmit frequency through the 10th harmonic were measured with peak detector.



2. The EUT is then put into continuously transmitting mode at its maximum power level during the test. And the maximum value of the receiver should be recorded as (Pr).
3. The EUT shall be replaced by a substitution antenna. The test setup refers to figure below.



In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (P_{Mea}) is applied to the input of the substitution antenna. Adjust the level of the signal generator output until the value of the receiver reaches the previously recorded (P_r). The power of signal source (P_{Mea}) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.

4. The Path loss (P_{pl}) between the Signal Source with the Substitution Antenna and the Substitution Antenna Gain (G_a) should be recorded after test.

An amplifier should be connected in for the test.

The Path loss (P_{pl}) is the summation of the cable loss and the gain of the amplifier.

The measurement results are obtained as described below:

$$\text{Power (EIRP)} = P_{\text{Mea}} + P_{\text{pl}} + G_a$$

5. This value is EIRP since the measurement is calibrated using an antenna of known gain (unit: dB μ) and known input power.
6. ERP can be calculated from EIRP by subtracting the gain of the dipole, $\text{ERP} = \text{EIRP} - 2.15\text{dB}$.

A.2.2 Measurement Limit

CFR Part 90.691 all specify that the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. The specification that emissions shall be attenuated below the transmitter power (P) by at least $43 + 10 \log (P)$ dB, translates in the relevant power range (1 to 0.001 W) to -13 dBm. At 1 W the specified minimum attenuation becomes 43 dB and relative to a 30 dBm (1 W) carrier becomes a limit of -13 dBm. At 0.001 W (0 dBm) the minimum attenuation is 13 dB, which again yields a limit of -13 dBm. In this way a translation of the specification from relative to absolute terms is carried out.

A.2.3 Measurement Results

Radiated emissions measurements were made only at the upper and lower carrier frequencies of the CDMA BC10 (817.9MHz and 823.1MHz). It was decided that measurements at these three carrier frequencies would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the CDMA BC0, CDMA BC1 or CDMA BC10 into any of the other blocks.

The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

UAT Measurement Results:
CDMA BC10, Channel 475

Frequency (MHz)	P _{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Polarization
1636.01	-61.08	3.56	5.26	2.15	-61.53	-13.00	V
2454.00	-51.75	4.58	5.96	2.15	-52.52	-13.00	V
3272.02	-55.72	5.28	7.65	2.15	-55.50	-13.00	H
4085.02	-56.49	6.04	8.99	2.15	-55.69	-13.00	H
4911.01	-55.68	6.73	9.81	2.15	-54.75	-13.00	V
5729.01	-55.11	7.29	10.55	2.15	-54.00	-13.00	H

CDMA BC10, Channel 684

Frequency (MHz)	P _{Mea} (dBm)	Path Loss(dB)	Antenna Gain(dBi)	Correction (dB)	Peak ERP(dBm)	Limit (dBm)	Polarization
1648.01	-60.34	3.56	5.23	2.15	-60.82	-13.00	V
2468.00	-52.03	4.59	6.00	2.15	-52.77	-13.00	H
3294.02	-54.92	5.29	7.71	2.15	-54.65	-13.00	V
4115.02	-55.87	6.04	9.02	2.15	-55.04	-13.00	H
4943.01	-56.16	6.70	9.84	2.15	-55.17	-13.00	H
5758.01	-53.66	7.25	10.55	2.15	-52.51	-13.00	V

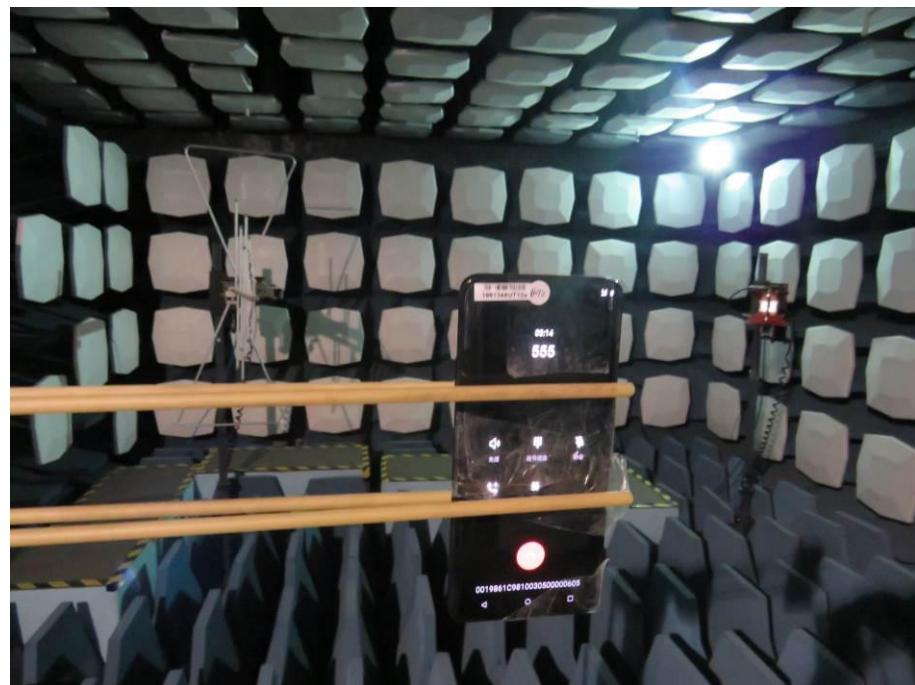
Sample calculation: 1648.01MHz

$$\begin{aligned}
 \text{Peak ERP (dBm)} &= P_{\text{Mea}}(-60.34 \text{ dBm}) - P_{\text{cl}}(3.56 \text{ dB}) - G_a (-5.23 \text{ dBi}) - 2.15 \text{ dBm} \\
 &= -60.82 \text{ dBm}
 \end{aligned}$$

 Note: Expanded measurement uncertainty is $U = 5.16 \text{ dB}$, $k = 2$.

Note2: The worst case is verified for LAT.

ANNEX B: TEST LAYOUT



Pic.1 Radiated spurious emission

*****END OF REPORT*****